CLAIMS

The invention claimed is:

1. An electric power switch, comprising:

an impedance;

a power contactor comprising a linearly moving contactor having a fixed contact and a moving contact, and operable for closing an electric power circuit on a closing stroke and opening the electric circuit on an opening stroke;

an impedance contactor operable for entering the impedance into the circuit on the closing stroke and removing the impedance from the circuit on the opening stroke;

the impedance contactor comprising a linear moving butt contactor having a retracting contact positioned adjacent to the fixed contact of the power contactor and a traveling contact that moves with the moving contact of the power contactor;

a timing device operable for causing the impedance contactor to close before the power contactor on the closing stroke, and to cause the impedance contactor to open before the power contactor on the opening stroke, and

a container filled with dielectric gas housing the power contactor and the impedance contactor.

2. The electric power switch of claim 1, wherein the container comprises an insulator extending between first and second ends a sufficient distance to prevent arcing from occurring between a first electric power terminal located at the first end and a second electric power terminal located at the second end when a rated voltage for the switch is applied across the power terminals.

3. The electric power switch of claim 1, wherein the container comprises a grounded conductive tank.

4. The electric power switch of claim 2, wherein the impedance is housed within a conductive cap comprising the first electric power terminal located at the first end of the insulator.

5. The electric power switch of claim 2, wherein the charging impedance is electrically connected to the contactors within the insulator with internal posts.

6. The electric power switch of claim 5, further comprising a capacitor introduced into the electric power circuit during the closing stroke and disconnected from the electric power circuit during the opening stroke.

7. The electric power switch of claim 6, further comprising an accelerator driving the power contactor and the impedance contactor at sufficient speed to avoid a restrike during the opening stroke when the capacitor is removed from the electric circuit.

8. The electric power switch of claim 1, wherein:

the retracting contact of the impedance contactor comprises a conductive ring positioned around the fixed contact of the power contactor; and

the traveling contact of the impedance contactor comprises a conductive ring positioned around the moving contact of the power contactor.

9. The electric power switch of claim 8, wherein the timing device controls the movement of the retracting contact during the opening stroke.

10. The electric power switch of claim 9, wherein the timing device comprises a puffer mechanism that resists movement of the retracting contact between the retracted position and the extended position through pneumatic compression on the opening stroke.

11. The electric power switch of claim 10, wherein the puffer mechanism comprises a chamber integral with the retracting contact and a restrictive orifice venting the chamber.

12. The electric power switch of claim 11, further comprising a flow control device affecting the size of the restrictive orifice and thereby adjusting the timing of the movement of the retracting contactor during the opening stroke.

13. The electric power switch of claim 12, further comprising a nozzle configured to direct a stream of the dielectric gas into a contactor gap occurring across the power contactor during the closing stroke and during the opening stroke.

14. An electric power switch, comprising:

an impedance;

a power contactor including a fixed contact and a moving contact operable for closing an electric power circuit on a closing stroke and opening the circuit on an opening stroke;

an impedance contactor operable for entering the impedance into the circuit on the closing stroke and removing the impedance from the circuit on the opening stroke;

the impedance contactor including a retracting contact positioned adjacent to the fixed contact and a traveling contact that moves with the moving contact;

the retracting contact movable between an extended position and a retracted position, and configured to retract from the extended position to the retracted position under force applied by the traveling contact during the closing stroke;

a container filled with dielectric gas housing the power contactor;

a nozzle configured to direct a stream of the dielectric gas into a contactor gap occurring across the fixed contact and the moving contact of the power contactor during the closing stroke and during the opening stroke;

an accelerator driving the power contactor and the impedance contactor at sufficient speed to avoid a restrike during the opening stroke; and

a timing device operable for controlling the movement of the retracting contact to cause the impedance contactor to close before the power contactor on the closing stroke, and to cause the impedance contactor to open before the power contactor on the opening stroke.

15. The electric power switch of claim 14, wherein the power contactor comprises a penetrating contactor and the impedance contactor comprises a butt contactor.

16. The electric power switch of claim 14, wherein the impedance contactor is located inside the dielectric gas container.

17. The electric power switch of claim 16, further comprising a capacitor introduced into the electric power circuit during the closing stroke and disconnected from the electric power circuit during the opening stroke.

18. The electric power switch of claim 17, wherein the container comprises an insulator extending between first and second ends a sufficient distance to prevent arcing from occurring between a first electric power terminal located at the first end and a second electric power terminal located at the second end when a rated voltage for the switch is applied across the power terminals.

19. The electric power switch of claim 17, wherein the container comprises a grounded conductive tank.

20. The electric power switch of claim 18, wherein the impedance is housed within a conductive cap comprising the first electric power terminal located at the first end of the insulator.

21. The electric power switch of claim 20, wherein the charging impedance is electrically connected to the contactors within the insulator with internal posts.

22. The electric power switch of claim 21, wherein:

the traveling contact of the impedance contactor comprises a conductive ring positioned around the moving contact of the power contactor; and

the retracting contact of the impedance contactor comprises a conductive ring positioned around the fixed contact of the power contactor.

23. The electric power switch of claim 22, further comprising a spring biasing the retracting contact toward the extended position.

24. The electric power switch of claim 23, wherein the puffer mechanism comprises a chamber integral with the retracting contact and a restrictive orifice venting the chamber.

25. The electric power switch of claim 24, further comprising a flow control device affecting the size of the restrictive orifice and thereby adjusting the timing of the movement of the retracting contactor.

26. An electric power switch, comprising:

a container filled with dielectric gas comprising an insulator extending between first and second ends a sufficient distance to prevent arcing from occurring between a first electric power terminal located at the first end and a second electric power terminal located at the second end when a rated voltage for the switch is applied across the power terminals;

an impedance housed within a conductive cap comprising the first electric power terminal located at the first end of the insulator;

a power contactor comprising a linearly moving penetrating contactor housed within the insulator, having a fixed contact and a moving contact, and operable for closing an electric power circuit on a closing stroke and opening the electric circuit on an opening stroke;

an impedance contactor housed within the insulator and operable for entering the impedance into the circuit on the closing stroke and removing the impedance from the circuit on the opening stroke;

the impedance contactor comprising a linear moving butt contactor having a retracting contact positioned adjacent to the fixed contact of the power contactor and a traveling contact that moves with the moving contact of the power contactor; and

a timing device operable for causing the impedance contactor to close before the power contactor on the closing stroke, and to cause the impedance contactor to open before the power contactor on the opening stroke.

27. The electric power switch of claim 26, wherein:

the retracting contact of the impedance contactor comprises a conductive ring positioned around the fixed contact of the power contactor; and

the traveling contact of the impedance contactor comprises a conductive ring positioned around the moving contact of the power contactor.

28. The electric power switch of claim 26, wherein the timing device comprises a puffer mechanism that resists movement of the retracting contact between the retracted position and the extended position through pneumatic compression on the opening stroke.

29. The electric power switch of claim 28, further comprising a flow control device affecting the size of a restrictive orifice of the puffer mechanism and thereby adjusting the timing of the movement of the retracting contactor.

30. The electric power switch of claim 26, further comprising a capacitor introduced into the electric power circuit during the closing stroke and disconnected from the electric power circuit during the opening stroke.

31. The electric power switch of claim 30, further comprising an accelerator driving the power contactor and the impedance contactor at sufficient speed to avoid a restrike during the opening stroke when the capacitor is removed from the electric circuit.

32. The electric power switch of claim 31, further comprising a nozzle configured to direct a stream of the dielectric gas into a contactor gap occurring across the fixed contact and the moving contact of the power contactor during the closing stroke and during the opening stroke.

33. The electric power switch of claim 32, wherein the charging impedance is electrically connected to the contactors within the insulator with internal posts.